Alaska Salmon

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Unit
13

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Photo above:
Pink salmon spawning in an Alaska river.

INTRODUCTION

Pacific salmon have played an important and pivotal role in the history of Alaska. Salmon, along with mining, timber, and furs, were the keystone natural resources that led to the settling and development of the 49th state by non-native peoples. Even now, the abundant salmon resources of this region continue to shape much of the contemporary lives of residents and visitors to Alaska. Alaska native peoples and their heritage have a long, colorful bond with salmon as an economic, cultural, and subsistence necessity. This heritage incorporated some of the most highly developed aboriginal fishing complexes anywhere (Cooley, 1961; Betts and Wolf, 1992).

Today many Alaskans still depend heavily on salmon for recreation, food, and industry. Commercial harvesting and processing, along with rapidly growing tourism-based guided sport fishing for salmon, provides the state with its largest private sector employment. Subsistence use by rural Alaskans is still an important part of the overall salmon story, accounting for around 1 million fish per year (ADFG, 2005; NPAFC, 2005).

Alaska commercial salmon harvests generally have increased over the last 3 decades (Figure 13-1). After reaching record low catch levels in the 1970's, most populations rebounded and fisheries in recent years have been at or near all-time peak levels in many regions of the state (Burger and Wertheimer, 1995; Baker et al., 1996; Wertheimer, 1997; Byerly et al., 1999; McGee, 2004;). The record-high commercial landings of 218 million salmon in 1995 were 17% higher than the previous record of 196 million salmon in 1994. Throughout the mid to late 1990's, recreational and subsistence fishermen harvested between 2 and 3 million salmon annually (Howe et al., 2001; ADFG, 2005; NPAFC, 2005).

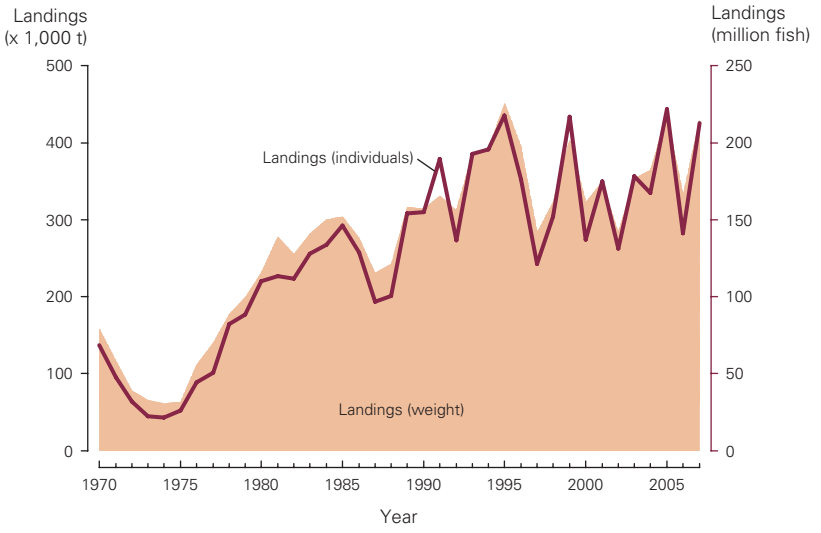

Figure 13-1
Commercial landings of Alaska salmon (all species) in metric tons (t) and individual fish, 1970–2007.

A number of factors have contributed to the current high abundance of Alaska salmon. These include 1) pristine habitats with minimal impacts from extensive development; 2) generally favorable oceanic conditions that allow high survival of juveniles; 3) improved fisheries management by state and Federal agencies; 4) elimination of high-seas drift-net fisheries by foreign nations; 5) a well-managed hatchery production system; and 6) some reductions of salmon bycatch in fisheries for other species.

Significant declines in commercial catches occurred during the 3 years following the peak harvest in 1995 and were thought by many to possibly indicate the beginning of a major downturn in productivity of Alaska salmon. Historical commercial landings show a distinct cyclic pattern of alternating high and low harvests, often lasting decades. Much of this fluctuation is now believed to be due to inter-decadal climate oscillations in the ocean environment (Mantua et al., 1997; Minobe and Mantua, 1999) that affect marine survival of juveniles. A major climatic regime shift occurred in 1977 and helped Alaska salmon stocks rebound from the previous years of low abundance. There is concern that another regime shift in 1989 (Hare and Mantua, 2000) may lead to a downward trend in Alaska's salmon resources.

An interesting pattern associated with Alaska's cyclic salmon harvest is an inverse production regime with abundance levels of West Coast salmon (Hare et al., 1999). Recent increases in numbers of some West Coast salmon, therefore, may also suggest a declining trend for Alaska salmon. However, no conclusive evidence of a decline is available from recent catch histories. While Alaska's commercial catch did decline in the 3 years following the record 1995 harvest, landings in 1999 reached 217 million fish, nearly matching the peak harvest year of 1995. Landings in 2000 fell to 137 million salmon, rebounded to 175 million fish in 2001, again dropped to 131 million in 2002, increased to 178 million in 2003, and then reached a new all-time high harvest level of 222 million salmon in 2005. Harvest levels in 2006 and 2007 were 141 and 213 million salmon, respectively. All of these recent Alaska harvests are well above the long-term average, in spite of some rebounds that West Coast salmon runs have experienced. Unspoiled freshwater habitats, favorable oceanic conditions, and adequate numbers of salmon returning to spawn in rivers and streams are likely the paramount issues affecting current Alaska salmon abundance. Alaska salmon management continues to focus on maintaining pristine habitats and ensuring adequate escapements.

MANAGEMENT

Alaska's 34,000-mile coast is nearly two-thirds the length of the coastline of the coterminous lower 48 states. Along this coastline, over 14,000 water bodies support populations of five species of salmon. Salmon management over such a vast area requires a complex mixture of domestic and international bodies, treaties, regulations, and other agreements. Federal and state agencies cooperate in managing Alaska salmon fisheries. The Alaska Department of Fish and Game (ADFG) manages salmon fisheries within state jurisdictional waters, where the majority of harvest occurs. ADFG's principal salmon conservation policy is based on escapement-based management, providing adequate spawning escapement into natal streams over any preseason harvest goals. Management in the U.S. Exclusive Economic Zone (EEZ; 3–200 n.mi. offshore) is the responsibility of the North Pacific Fishery Management Council (NPFMC), which has deferred specific regulations to the State of Alaska. Management of state salmon fisheries is

based primarily on regional stock groups of each species, and on time and area harvesting by specific types of fishing gear.

Over 25 different commercial salmon fisheries are managed within a special limited-entry permit system that specifies when, where, and what type of fishing gear can be used in each area of the state. These fisheries, extending from Dixon Entrance in southeastern Alaska to Norton Sound in the Bering Sea, are allowed to catch salmon in different fisheries with drift gillnets, set gillnets, beach seines, purse seines, hand trolls, power trolls, or fish wheel harvest gear (CFEC, 1997). Sport fishing is limited to hook and line, while subsistence fishermen may use gillnets, dip nets, or hook and line. Special permits also regulate some native subsistence harvesting of salmon; and in some rivers, fish wheels are allowed.

Management of some Alaska salmon fisheries is also negotiated with Canada under the Pacific Salmon Treaty, first implemented in 1985. The initial fishing agreements between the two countries, setting catch allocations and ceilings for individual fisheries and species, were based on an individual-stock-based management (ISBM) principle. In 1999, a new fishery management regime was reached under the Treaty, based on the aggregate abundance-based management (AABM) principle (PSC, 1999). This new accord, originally proposed by Alaska, sets overall harvest levels based on the fluctuating abundance levels for groups of stocks of different species.

Major issues of concern between the two countries include 1) Chinook salmon catches in southeastern Alaska, where Canadian salmon are caught along with other non-Alaska U.S. stocks; 2) fisheries in the Dixon Entrance area, where each country catches salmon originating in the other nation; 3) transboundary river stocks and fisheries associated primarily with the Alsek, Taku, and Stikine Rivers; 4) Canadian fisheries off the west coast of Vancouver Island that catch salmon bound for Washington, Oregon, and the Columbia River; and 5) Strait of Juan de Fuca fisheries for sockeye and pink salmon bound for the Fraser River in Canada. Chinook salmon issues under the Treaty are among the more important concerns affecting Alaska fisheries (PSC, 1999, 2004). Currently treaty negotiations are underway between the two countries to establish a new 10-year management regime.

Karen Ducey, NMFS

Crew members on a commercial fishing vessel removing salmon from a gillnet in Bristol Bay, Alaska.

Another area involving Alaska salmon and negotiations with Canada concerns the stocks and fisheries in the 2000-mile-long Yukon River system. After 16 years of deadlocked talks, an agreement was recently adopted and signed, setting harvest quotas and establishing restoration, conservation, and management programs for Yukon River Chinook and chum salmon stocks.

On a broader international scope, the management of salmon harvest in the high seas of the North Pacific Ocean from 1957 to 1992 was under the International North Pacific Fisheries Commission (INPFC) and bilateral and multilateral agreements negotiated with Taiwan and the Republic of Korea. In 1993, the North Pacific Anadromous Fish Commission (NPAFC) replaced the INPFC. Initial signatories to the new Commission included Canada, Japan, the Russian Federation, and the United States. In 2003, the Republic of Korea officially joined the Commission, which now provides a broad framework for international cooperation in salmon management and research in the North Pacific Ocean.

The NPAFC Convention prohibits high seas salmon fishing and trafficking of illegally caught salmon. Coupled with United Nations General Assembly (UNGA) Resolution 46/215, which bans large-scale pelagic driftnet fishing in the world's oceans, harvesting of Pacific salmon on the high

Table 13-1
Productivity in metric tons (t) and status of Alaska salmon fisheries resources.

Species/stock	Recent average yield (RAY)[1]	Current yield (CY)[2]	Sustainable yield (MSY)[2]	Stock level relative to B_{MSY}	Harvest rate	Stock status
Chinook salmon	5,106	5,200	5,200	Below	Not overfishing	Not overfished
Chum salmon[3]	61,636	51,600	51,600	Above		
Coho salmon[3]	15,642	17,600	17,600	Below		
Pink salmon[3]	179,632	135,300	135,300	Above		
Sockeye salmon[3]	115,433	108,200	108,200	Above		
Total	377,449	317,900	317,900			

[1]2001–03 average.
[2]1980–2003 average.
[3]Part of the Coho Salmon Assemblage. Collectively, the Assemblage is not overfishing and not overfished.

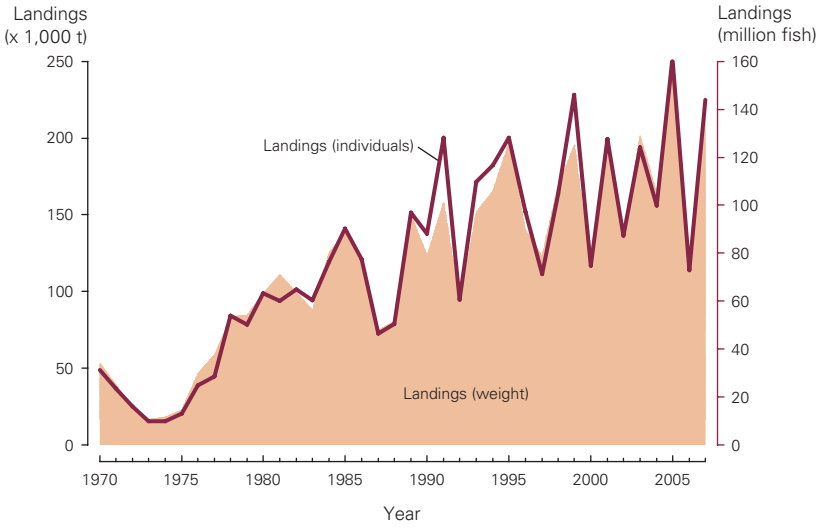

Figure 13-2
Commercial landings of Alaska pink salmon in metric tons (t) and individual fish, 1970–2007.

seas, except for illegal fishing, no longer exists. Thus, effective management control was returned to the salmon-producing nations. A basic premise of NPAFC policy is that the country of origin has proprietary ownership of its stocks even as free-swimming adults in the open ocean. NPAFC, with agreement among the five parties, has also established a formal science plan to help direct priority research for better knowledge of salmon stocks around the Pacific Rim.

Because salmon are anadromous and spend a portion of their lives in freshwater streams, rivers, and lakes, the health of salmon populations in Alaska is directly influenced by land management practices. The quality of freshwater habitats determines the success of both reproduction and initial rearing of juveniles. Several agencies, entities, and groups have significant influence on the quality of freshwater spawning and rearing habitats for salmon throughout the state. Included among these are the U.S. Forest Service, Bureau of Land Management, National Park Service, National Wildlife Refuges, Alaska State Parks and Forests, and Alaska Native Regional and Village Corporations, as well as municipalities, boroughs, and private landowners that control watersheds used by salmon.

SPECIES AND STATUS

All five species of Alaska salmon (pink, sockeye, chum, coho, and Chinook) are fully utilized, and stocks in most regions of the state have rebuilt to near or beyond previous high levels (Table 13-1). Research into all aspects of the life histories of Pacific salmon has been extensive (Groot and Margolis, 1991), and this information has been used to regulate fisheries by monitoring escapement size and catch numbers by species, season, and area. Although there has been a high statewide abundance of salmon, there are issues of serious concern for some stocks, especially for certain species and regions. For example, stocks in western Alaska (especially Chinook and chum salmon) have generally been at very depressed levels since the mid 1990's. Some of the same issues implicated in the declines of Pacific Northwest salmon stocks are of concern in certain areas of Alaska. These issues include overfishing, incidental take of salmon as bycatch in other fisheries, and loss of freshwater spawning and rearing habitats.

Pink Salmon

Pink salmon are the most abundant species of Pacific salmon in Alaska (Figure 13-2), account-

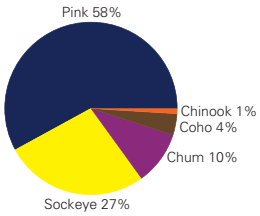

Figure 13-3
Alaska commercial salmon landings by numbers of fish, averaged over 1970–2007.

ing for 40 to 70% of the total harvest each year. During the past 37-year period (1970–2007), pink salmon comprised 58% of the average annual commercial harvest of salmon in Alaska (Figure 13-3). Pink salmon are mostly harvested by purse seines in southeastern and central southern Alaska, as well as around Kodiak Island. In Prince William Sound, hatcheries produce a large portion of the pink salmon catch.

Unique among Pacific salmon, pink salmon have a fixed life history cycle whereby the species always matures and spawns at 2 years of age. This cycle is genetically set so that spawners in even-numbered years are always separate and distinct from spawners in odd-numbered years. Throughout much of its range, the species has viable populations in both odd- and even-numbered years; however, in some areas pink salmon only occur in one or the other cycle year. In Bristol Bay and western Alaska, for example, pink salmon are near the effective limit of their northern range and occur mostly in even-numbered years. At the southern limit of their range (the Pacific Northwest), they occur primarily in odd-numbered years. There is, however, growing evidence of population increases of pink salmon and other salmon species in northern parts of western Alaska (Norton Sound and Kotzebue Sound), perhaps due to climatic changes.

Sockeye Salmon

Sockeye salmon, the second most abundant species caught in Alaska fisheries (Figures 13-3, 13-4), accounted for 27% of the harvest in recent years (ADFG, 2007). Sockeye salmon, however, provide a greater dollar value than all other commercially caught salmon in Alaska combined, usually yielding between 60 and 70% of the ex-vessel value of the annual harvest. Bristol Bay sockeye salmon in southwestern Alaska is the most valuable wild capture fishery for salmon in the world, previously yielding $300 to $400 million (ex-vessel) per year in the 1980's and early 1990's. In the late 1990's and early 2000's, prices declined significantly, and the ex-vessel value of Bristol Bay sockeye salmon has averaged only $77 million per year during the past 10-year period of 1998–2007 (ADFG, 2007). A recent upswing in Alaska sockeye salmon prices in Bristol Bay from 2004–06 has averaged $103 million per year in ex-vessel value.

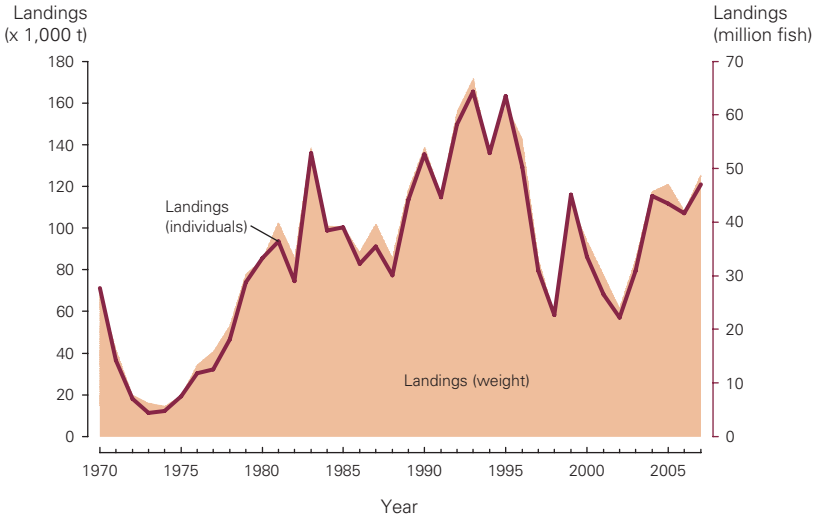

Figure 13-4
Commercial landings of Alaska sockeye salmon in metric tons (t) and individual fish, 1970–2007.

Sockeye salmon are harvested by purse seine in southeastern Alaska, Kodiak Island, and Chignik fisheries and by drift gillnet or set gillnet throughout the state. The largest fisheries for sockeye salmon occur in Bristol Bay, Cook Inlet, the Alaska Peninsula and Aleutian Islands, and Kodiak Island regions. Other significant fisheries also occur in southeastern Alaska, Prince William Sound, and Chignik.

Juvenile sockeye salmon most commonly grow in lakes for 1 to 2 years before migrating seaward as smolts. The large lake complexes associated with Bristol Bay rivers provide this necessary life history component and form a critical part of the important fishery in this region. The Bristol Bay fishery, based on drift and set gillnet catches, is concentrated in a narrow window of time from late June until mid July when millions of returning adult sockeye salmon pour into Bristol Bay rivers from the ocean.

Commercial sockeye salmon catches in Bristol Bay in 1997 (12.1 million fish) and 1998 (10.0

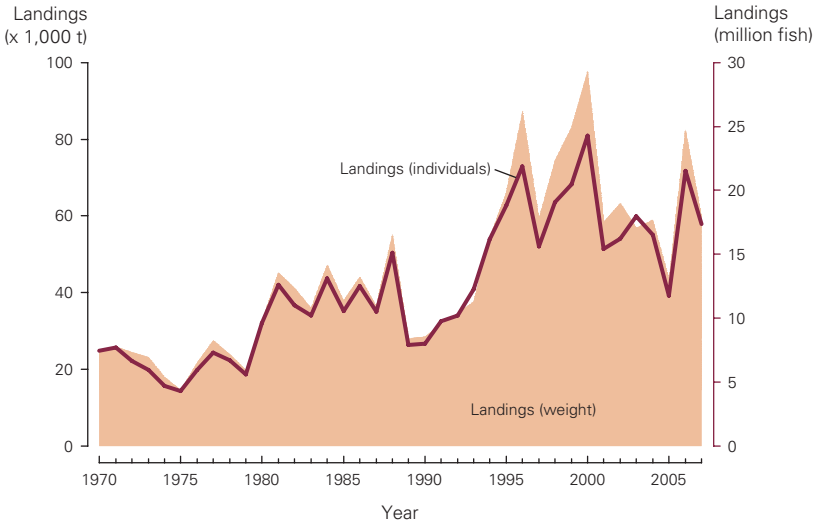

Figure 13-5
Commercial landings of Alaska chum salmon in metric tons (t) and individual fish, 1970–2007.

million) fell sharply, relative to harvest levels that averaged 36.5 million sockeye salmon per year during the previous 5-year period, 1992–96. Returns improved somewhat in 1999 and 2000, with commercial catches of 26.1 and 20.5 million sockeye salmon respectively, but declined again in 2001, 2002, and 2003 with commercial catches of only 14.2, 10.7, and 14.9 million fish, respectively (ADFG, 2007). Beginning in 2004, commercial catches again improved to 26.3 million, followed by catches of 24.5, 28.5, and 29.5 million, respectively, in 2005, 2006, and 2007. Most of these recent harvest levels of sockeye salmon in Bristol Bay are well below previous decadal averages. These low returns continue to create significant hardships to state residents and fishermen dependent on this fishery.

Several hypotheses have been suggested to explain recent declines in sockeye salmon returning to Bristol Bay. One hypothesis suggests that unusually warm and calm summer weather has resulted in warmer water temperatures. Elevated water temperatures may cause high mortality and changes in migration of adult salmon entering Bristol Bay. Other hypotheses include changes in freshwater or ocean rearing conditions affecting the growth and survival of juveniles and immature adults, increased predation at sea, interception by other fisheries, disease, and in some instances, over-escapements on spawning grounds. The true causes likely involve a combination of many factors and remain unknown. It is also unknown whether these shortfalls are due to a shift in cyclical oceanic conditions, which could lead to lower survival and smaller sockeye returns in future years.

Chum Salmon

Chum salmon (Figure 13-5) are harvested commercially by purse seines, drift and set gillnets, and in large western Alaska rivers by fishwheels in subsistence fisheries. Over the 37-year period from 1970 to 2007, chum salmon accounted for 10% of Alaska's salmon harvest (Figure 13-3). Statewide average annual catches of chum salmon were 18.6 million fish during 1996–2003. The harvest in 2000 was well above this average, with a record harvest of 24.3 million fish (ADFG, 2007). Currently, 60–70% of the commercially harvested chum salmon in Alaska occur in the southeastern region, where hatcheries produce a significant portion of the catch.

Recently, chum salmon runs in southwestern and western Alaska, similar to sockeye salmon in Bristol Bay, have been well below long-term averages, which has added to the hardships experienced by fishermen in those regions. Western Alaska chum salmon may spend part of their ocean life in the Gulf of Alaska and then funnel through the Aleutian Island passes as maturing adults on their return migration. Management of chum salmon fisheries in western Alaska is complicated because a fishery (targeting sockeye salmon returning to Bristol Bay) at False Pass in the Aleutian Islands incidentally harvests chum salmon destined for the Kuskokwim and Yukon Rivers in western Alaska. The Alaska Board of Fisheries has placed major restrictions on the False Pass fishery in an effort to help rebuild depleted chum salmon resources in western Alaska; however, at more recent Board meetings those restrictions were somewhat relaxed.

In some years significant numbers of chum salmon are incidentally caught as bycatch in Bering Sea groundfish fisheries that target walleye pollock and other groundfish species. Bycatch of chum salmon in these fisheries may have negative impacts on populations of stock originating from western Alaska rivers. Chum salmon in western Alaska are not only an important part of commercial fisheries in that region, but also a significant subsistence resource for local residents.

Coho Salmon

Coho salmon are caught commercially by purse seines in southeastern and central southern regions, by drift or set gillnets in all regions, and by hand and power troll gear in the southeastern region. Coho, along with sockeye and Chinook salmon, are popular target species in recreational fisheries throughout Alaska.

Commercial catches of coho salmon across Alaska in 2002 totaled 5.1 million fish and have averaged 4.5 million fish during the most recent 10-year period, 1998–2007 (ADFG, 2007). These harvest levels are well above the record low catches in the 1970's (Figure 13-6). This recent period of relatively high commercial harvests was due to generally favorable returns of both hatchery and wild coho salmon in the southeastern region, where over 3.0 million coho salmon were harvested in 1999, 2001, 2002, and 2004. Exceptionally high marine survivals of coho salmon smolts, averaging over 20% in some systems in this region, are thought to be the main reason for these harvest levels (Shaul et al., 2007). This favorable survival pattern, however, may be shifting. In 2007 the statewide harvest of coho salmon was 3.7 million fish, with 2.1 million from the southeast region (ADFG, 2007).

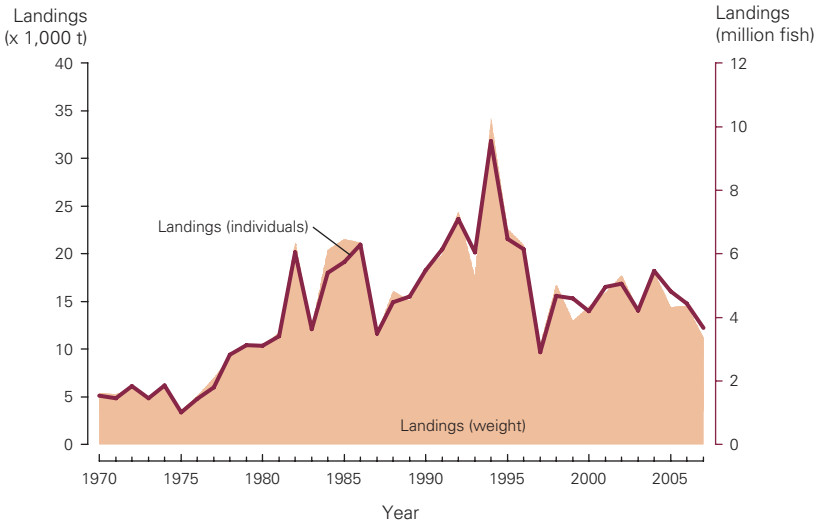

Figure 13-6
Commercial landings of Alaska coho salmon in metric tons (t) and individual fish, 1970–2007.

Chinook Salmon

The annual commercial harvest of Chinook salmon has ranged between 360,000 and 800,000 fish over the past two decades (Figure 13-7). The statewide 10-year (1998–2007) average annual harvest was 568,000 fish (ADFG, 2007). Chinook salmon, like coho salmon, are commercially harvested by purse seines in southeastern and central southern regions, by drift or set gillnets in all regions, and by hand and power troll gear in the southeastern region. In addition, fishwheels harvest Chinook salmon in western Alaska rivers for commercial sales and for subsistence uses.

In general, Chinook salmon are the first species each calendar year to begin spawning migrations into Alaska rivers. Fisheries are permitted to directly target these early returning runs of Chinook salmon in only a few Bristol Bay and western Alaska rivers. However, Chinook salmon are often taken as bycatch in fisheries targeted on other salmon. Sockeye salmon migrations into many larger river systems begin during the later portion of Chinook salmon runs in the same rivers. In these cases (such as certain Cook Inlet and southeastern rivers and in the Copper River near Cordova), significant numbers of Chinook salmon may be caught incidentally in fisheries targeting sockeye salmon. Some of these fisheries may have a quota in place limiting the catch of Chinook salmon.

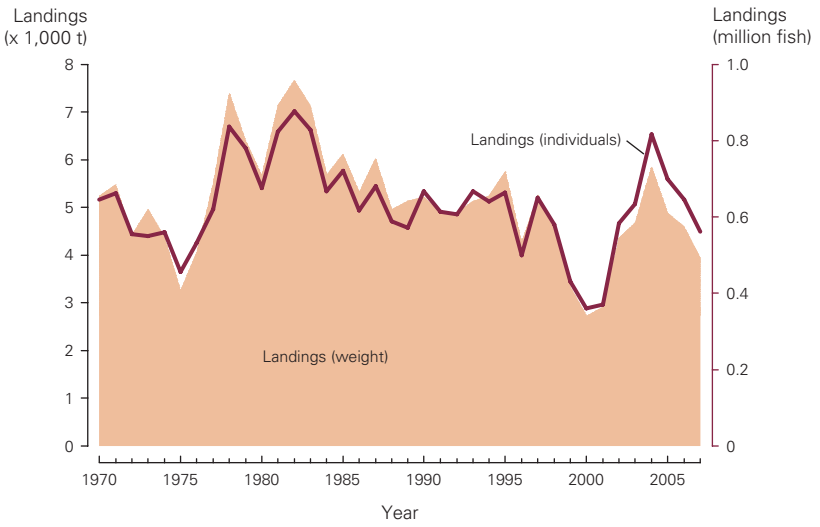

Figure 13-7
Commercial landings of Alaska Chinook salmon in metric tons (t) and individual fish, 1970–2007.

Chinook salmon stocks thoughout Alaska in

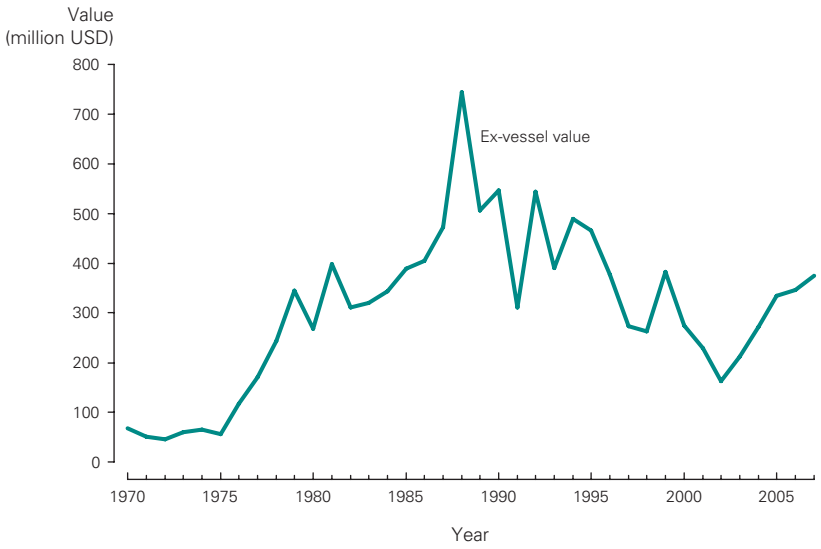

Figure 13-8
Ex-vessel value of Alaska commercial salmon landings, 1970–2007.

general have relatively stable sustainable populations (Heard, et al., 2007; Wertheimer, 1997). Western Alaska, however, is the one region of the state where there is concern over trends in abundance of this species. Harvest levels of Chinook salmon in Bristol Bay and in the Kuskokwim and Yukon Rivers have been in a declining mode since the 1980's. In 2001, runs into the Yukon River, a transboundary river originating in Canada and managed under a separate U.S.–Canada Treaty Annex, were so low that no commercial fishery was allowed. Another area of concern is the often large bycatch of Chinook salmon in Bering Sea groundfish fisheries and the likelihood that a significant part of this bycatch is from western Alaska stocks. In 2007 a total of 130,000 Chinook salmon were caught as bycatch in those fisheries (see groundfish catch reports at http://www.fakr.noaa.gov/).

A quota, under provisions of the Pacific Salmon Treaty, normally regulates the Chinook salmon harvest in southeastern Alaska, where significant numbers of non-Alaska-origin fish are caught. The Alaska Board of Fisheries, a jurisdictional body dealing with allocation of fisheries resources, then reallocates this annual harvest quota among various fisheries. For example, the troll fishery (both hand and power troll), which historically has been highly dependent on Chinook salmon, is allocated the largest portion of the southeastern Chinook salmon quota. Net fisheries in the region (purse seine and drift gillnet) primarily target pink, chum, or sockeye salmon but are provided quotas to take a limited catch of Chinook salmon in pursuit of other target species. The remaining allowable quota is allocated to guided and non-guided sport fisheries.

ISSUES

Value of Alaska Salmon

Although commercial harvests have been at high levels in recent years, the value of the catch has declined significantly due to a number of complex worldwide factors. The record 1995 statewide catch of 451,000 metric tons (t) was worth $466 million (ex-vessel), far less than the smaller 1992 harvest (312,000 t), valued at $546 million. The fluctuating but downward trend in ex-vessel value has persisted over much of the last decade (Figure 13-8), although there has been a moderate upward trend in ex-vessel value over the last 3 years (2005–07) primarily due to aggressive marketing campaigns. Along with this general decline in value is a rising trend in total worldwide salmon production (ASMI, 1993). Increases in world salmon supplies are due to rapid growth in the worldwide production of farmed salmon (Folsom et al., 1992), in addition to record catches of wild salmon and of fish produced from hatcheries and ocean ranching programs in Alaska, Japan, and Russia.

Total world production from capture and farmed fisheries in 2002 was about 1.8 million t, including 983,000 t of farmed salmon (Knapp, 2003). This production represents a continuation of recent trends for increased production of farmed salmon and lower prices paid to fishermen in capture fisheries (Heard, 1996, 1997). Decreases in the price paid for wild-caught salmon also characterize capture fisheries for salmon in Japan (Kaeriyama and Urawa, 1993) and elsewhere. Although Alaska's salmon harvest represents about 45% of all wild salmon caught, it only represents 19% of total world salmon production. While more than 15 countries now produce farmed salmon, over 70% of production comes from just three countries: Norway, Chile, and the United Kingdom (Knapp, 2003). Beginning in 2000, Norway's farmed Atlantic salmon annual production has exceeded the total Alaska commercial salmon harvest.

Recreational Salmon Fisheries

Recreational fishing continues to grow and be an important component of the Alaska lifestyle. This is partly due to the fact that many households use sport fishing as a convenient method to collect wholesome seafood for the table. Some part of the total recreational salmon fishery in Alaska, therefore, might more appropriately be included in subsistence fishery statistics. Much of the recent growth in recreational fishing is due to an increase in guided fishing trips for visitors and tourists. Sport fishing for salmon in Alaska as a recreational outlet is an important pursuit for both residents and visitors alike. Since 1990, the number of sport fishing licenses sold to nonresidents has exceeded the number sold to Alaska residents (Howe et al., 2001). A total of 392,980 sport fishing licenses were issued in 2002; 71% of these licenses were issued to nonresident anglers.[1] Sport fishing for salmon is a vital part of the recent rapid growth in Alaska tourism.

Coho salmon are the most popular recreational salmon species in Alaska, representing 38% of the 3.2 million salmon caught by recreational fishermen in 2002. This is followed by pink salmon (25%), sockeye salmon (21%), chum salmon (7%), Chinook salmon (5%), and non-anadromous landlocked salmon (4%).[2]

Bycatch and Multispecies Interactions

Salmon bycatch by U.S. groundfish fisheries in the Bering Sea and the Gulf of Alaska continues to be a problem in fisheries management. Although the groundfish fisheries are prohibited from retaining any salmon, many are taken incidentally, especially in trawl fisheries. Most of the bycatch are chum salmon and Chinook salmon. The problem is being addressed by the NPFMC through time–area closures and bycatch limits set for different gear types in the groundfish fisheries.

Protecting Salmon Habitats

Responsible conservation of Alaska's salmon resource is a national issue shared with the State of Alaska. Maintaining this renewable resource requires conservation of the thousands of miles of riparian habitat in the state that support salmon production. Competing uses for this habitat include logging, mining, oil and gas development, and industrial and urban development. Although progress has been made in setting Federal and state land-use guidelines, conflicts still occur. Natural resource managers continually face increasing demands from extractive industries to log, drill, or fill riparian habitats while working to change land-use laws. For example, the debate continues between land managers and the logging industry over the required size of clear-cut buffer zones along anadromous fish streams. In its recent review of timber harvest in the Tongass National Forest, the U.S. Forest Service concluded that long-term application of current timber harvest procedures could lead to (or continue) declines in habitat productivity and the eventual loss of salmon stocks. However, efforts are being made to protect the salmon resource and the habitats they depend on; the recent buy-back of Federal gas and oil leases in Bristol Bay is one such effort. A new proposed development in the Bristol Bay drainage area is the controversial Pebble Mine project that would build one of the largest open-pit gold and copper mines in the world. Many fisheries resource groups oppose this project.

William Heard, AFSC

A young sport fisherman with his coho salmon catch. Recreational salmon fishing is popular among state residents and draws many tourists from outside Alaska as well.

[1]Alaska Dept. of Fish and Game, data files.
[2]Alaska Dept. of Fish and Game, Sport Fish Division, data files.

William Heard, AFSC

Pink salmon fry.

Hatcheries and Ocean Ranching

Alaska's salmon enhancement programs produce significant numbers of fish for commercial and sport harvest. While most hatcheries are now operated by private-sector regional aquaculture associations, the state maintains oversight of the hatcheries and manages them to minimize catches of wild salmon in fisheries that catch large numbers of returning hatchery fish (McGee, 2004). However, overfishing is of concern where wild stocks are in low abundance and spawning escapement goals may not be achieved. Prince William Sound is an area of particular concern where large returns of hatchery pink salmon mix with lower numbers of wild fish. In a recent analysis, one group of scientists argued that the pink salmon hatchery program in Prince William Sound has essentially replaced the wild stock production that would have occurred in the absence of hatcheries (Hilborn and Eggers, 2000). Other scientists, however, have examined the same data sets and concluded that hatcheries in the region were primarily supplementing wild stock production, with net gains of 17.5–23.7 million pink salmon to fisheries in the region annually (Wertheimer et al., 2001, 2004).

The present statewide hatchery program, which began in 1974, contributed almost 73 million salmon to the total commercial salmon harvest in Alaska and 348,983 salmon to sport fisheries in 2003 (Farrington, 2004). Contributions to salmon fisheries from Alaska hatcheries vary considerably by species and region. Hatcheries make important contributions in southeastern Alaska to catches of chum, coho, and Chinook salmon; in Prince William Sound to catches of coho, pink, and sockeye salmon; in Cook Inlet to catches of coho, Chinook, and sockeye salmon; and in Kodiak to catches of coho salmon (Farrington, 2004; White, 2008).

Interception Fisheries

Significant progress has been made to control the interception and incidental take of Alaska's salmon resources. First, a former high-seas salmon fishery by Japan that was authorized by an international convention from 1952–92 was terminated under the new Convention for the Conservation of Anadromous Stocks in the North Pacific Ocean. Second, high-seas driftnet fisheries for squid by various countries that also intercepted U.S.-origin fish in the central North Pacific were terminated by United Nations General Assembly Resolution 46/215. The NPFMC actively manages the prob-

lem of salmon bycatch in U.S. groundfish fisheries in the Bering Sea and Gulf of Alaska through time–area closures and bycatch limits. Interceptions of nontarget salmon species within Alaska-managed salmon fisheries continue to be addressed by the Alaska Board of Fisheries. Additionally, negotiations continue between the United States and Canada under the Pacific Salmon Treaty to resolve long-standing interception issues, particularly in the northern British Columbia and Alaska boundary area.

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